Robot Programming #9

피에조 스피커

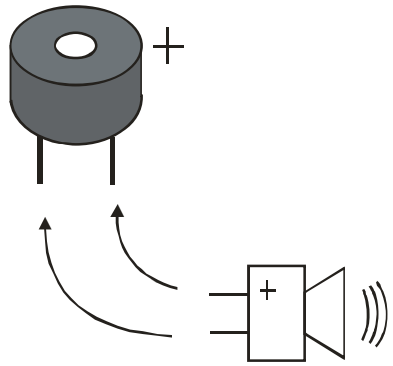
Dept. of Mech. Robotics and Energy Eng.
Dongguk University

Outputting to a piezo buzzer

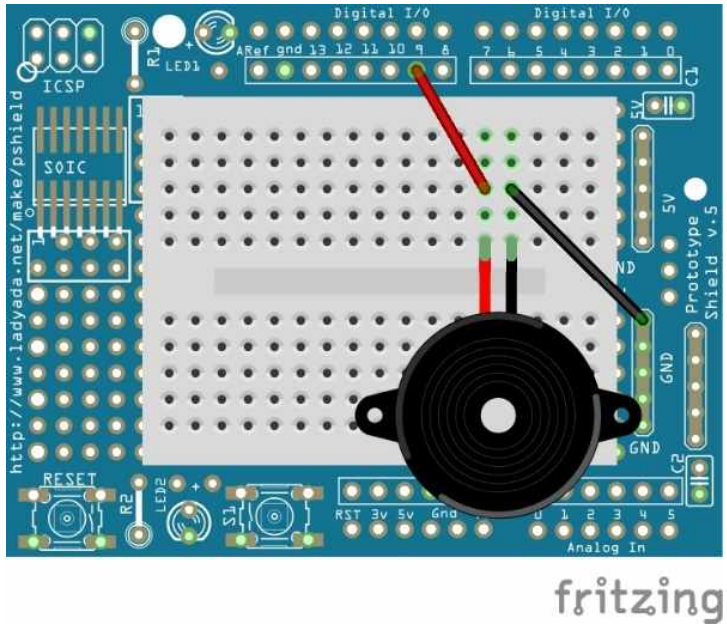
- We can connect the PWM output to a piezo buzzer to make sound.
- Arduino has tone() to generate sound.

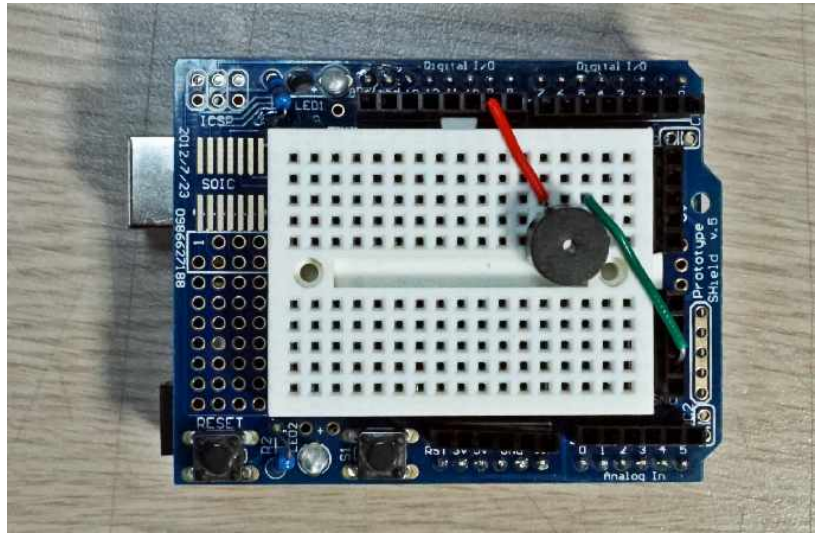
```
tone(pin, frequency, duration)
```

  - pin: the pin on which to generate the tone
  - frequency: the frequency of the tone in Hz.
  - duration: the duration of the tone in milliseconds.



Piezo Buzzer Wire Connection





Outputting to a piezo buzzer

- Change the frequency and the duration and notice the difference in sound with changes in frequency.

```
void setup() {
 pinMode(9, OUTPUT);
}

void loop() {
    tone(9, 440, 500);
    delay(500);
}
```

Music Maker

- Do to Do

```
int buzzer = 9;

void setup() {
    pinMode(buzzer, OUTPUT);
}
// Do Re Mi …
void loop() {
    tone(buzzer, 262, 500);   delay(500);
    tone(buzzer, 294, 500);   delay(500);
    tone(buzzer, 330, 500);   delay(500);
    tone(buzzer, 349, 500);   delay(500);
    tone(buzzer, 392, 500);   delay(500);
    tone(buzzer, 440, 500);   delay(500);
    tone(buzzer, 494, 500);   delay(500);
    tone(buzzer, 523, 500);   delay(500);
}
```

Outputting to a piezo buzzer

- Example code in arduino.cc

```
#include "pitches.h"

// notes in the melody:
int melody[] = {
  NOTE_C4, NOTE_G3, NOTE_G3, NOTE_A3, NOTE_G3, 0, NOTE_B3, NOTE_C4
};

// note durations: 4 = quarter note, 8 = eighth note, etc.:
int noteDurations[] = {
  4, 8, 8, 4, 4, 4, 4, 4
};
```

- You will need the header file “pitches.h” to run this program.

Outputting to a piezo buzzer

- Continued

```
void setup() {
// iterate over the notes of the melody:
  for (int thisNote = 0; thisNote < 8; thisNote++) {

// to calculate the note duration, take one second divided by the note type.
    //e.g. quarter note = 1000 / 4, eighth note = 1000/8, etc.
    int noteDuration = 1000 / noteDurations[thisNote];
    tone(9, melody[thisNote], noteDuration);

    // to distinguish the notes, set a minimum time between them.
    // the note's duration + 30% seems to work well:
    int pauseBetweenNotes = noteDuration * 1.30;
    delay(pauseBetweenNotes);
    // stop the tone playing:
    noTone(9);
  }
}

void loop() {
  // no need to repeat the melody.
}
```